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SPECIFICATION

TITLE OF INVENTION

Method and device for introducing state changes into athletic activities.

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR
DEVELOPMENT

Not Applicable.

REFERENCE TO SEQUENCE LISTING , A TABLE, OR A COMPUTER PROGRAM
LISTING COMPACT DISK APPENDIX

Not Applicable.

BACKGROUND OF THE INVENTION.

Most athletic activities require the participants to respond rapidly to changes in their environment. For instance, they must constantly reevaluate their course of action depending upon their own velocity and position and that of a ball, opposing players, and teammates. However in training, and especially in solo training, the environment tends to be largely static. In the game known as soccer in the U.S.A, and football elsewhere, a common training drill consists of a player dribbling a ball around a series of cones or other similar markers. Such variation as exists consists of predetermined decisions such

1 as to alternate between passing on the left on one cone and on the right on the next.

2 Effectively such training exists within an invariant environmental state.

3 The disadvantage of such a drill is that it does not train athletes to constantly
4 observe, analyze, and react, as they must in a real game. The present invention allows
5 the introduction of transitions between multiple environmental states, such transitions
6 being either strictly periodic or randomly varying in frequency, enabling in training
7 situations a better simulation of the timing and thought processes of the game in question.
8 The invention also allows new types of games to be created and played which incorporate
9 the varying states expressed by the device into the play of the game. The invention
10 accomplishes these goals by maintaining a time varying internal state which is transmitted
11 to athletes, typically via a visual method such as colored lights, so that the athletes may
12 interpret these signals as a change in the training or game environment. In the soccer
13 training drill the invention would replace the traditional practice cone and would indicate
14 to the player the manner in which the ball should be passed around the obstacle.

15 The intentional introduction of transitions between multiple contest states is
16 common in arcade and video games and other electronic entertainment but there is little
17 precedent for this in athletics. The only common examples occur at or before the actual
18 contest: the opening toss of a coin before a game or the drop of the flag in an automobile
19 race. In music the periodic signal from a metronome is often used and there may be
20 instances where the signal from such a metronome has been used to aid athletes
21 synchronize their movements to music. That differs from the utility of the present

1 invention, which is not synchronization, but the presentation of varying training or game
2 states to the athlete.

3 The following U.S. patents disclose concepts that bear some relation to the present
4 invention. However, none of the cited prior art discloses an invention having the
5 versatility or utility of the present invention.

6 Stuler U.S. Pat. No. 3,629,600 discloses a battery powered traffic light controller.
7 This and other traffic controllers differ markedly from the device of the current patent
8 application. Such controllers transition between their 3 states (green,yellow,red) in a
9 single fixed order. Additionally, these transitions are either triggered by external sensors
10 or occur at fixed time intervals. The present invention does not use external sensors to
11 trigger state transitions. Instead, a large repertoire of randomly varying state transitions
12 useful in athletic training are provided. The traffic controllers would be predictable and
13 useless for injecting variation into athletic training. Conversely, the device of the present
14 patent, when configured appropriately for athletic training, would lead to havoc if utilized
15 as a traffic controller.

16 Ramsey U.S. Pat. No. 5,325,340 discloses an athletic training device which is
17 utilized for pacing. Its function is the antithesis of that of the device of the present patent
18 application. The pacing device produces a certainty. It tells the athlete exactly where to
19 be at a given time and even goes so far as to provide a correction signal when the athlete
20 is too far ahead or behind. The present device produces an uncertainty. Its purpose is to
21 present a signal which is variable and unpredictable. Moreover, the feedback circuit of

1 Ramsey's device requires a measurement of the athlete's position. No such measurement
2 is required or supported by the present invention.

3 Karrenberg U.S. Pat. No. 4,949,320 and Heywood et al. U.S. Pat No. 3,789,402
4 disclose athletic interval training devices. These devices indicate to the athlete a period
5 for each of several athletic activities, typically a repeating run/walk/rest cycle. These
6 devices are essentially modified clocks, they provide the athlete with a fixed and utterly
7 predictable series of changes in the athletic environment. The present device produces an
8 uncertainty – the athlete cannot predict, except statistically, what the environmental state
9 signaled by the device will be at some future time. Both the cited devices and the present
10 device allow the athlete to set the mean time in each state. However, the present device
11 will only asymptotically approach that mean time over a long period and will have a large
12 variance in the duration of each state. Conversely, the cited devices will have no variance
13 (within the accuracy of the implementation) in the duration of each state. This is
14 consistent with the intended uses. The cited devices are long term pacing devices,
15 indicating to the athlete a particular exertion level to maintain for several minutes. The
16 present device instead attempts to mimic the unpredictable and often rapid changes that
17 occur in athletic events.

18 Miley U.S. Pat. No. 5,921,890 discloses yet another athletic pacing device, this
19 one being optimized for use in swimming. As is true for the pacing devices disclosed
20 above, it is designed to produce a certainty, in this case it emits a periodic signal to which
21 the athlete attempts to synchronize swimming strokes. The utility of the present device is

1 quite different, it is intended to signal unpredictable changes in the athletic environment.
2 The sorts of unpredictable state changes provided by the present device are not
3 appropriate for this type of pacing training. The present device would be better employed
4 aquatically in the training of water polo players, who could be signaled to swim in various
5 directions, for various periods of time, in an unpredictable manner.

6 Goldfarb et al. U.S. Pat. No. 3,933,354 discloses a martial arts amusement device
7 in which a light at one of ten positions on a picture of a combatant is lit. When a player
8 strikes that position the light turns off, the player's score is incremented, and the game
9 lights another region on the simulated combatant. The lights are selected from a pattern
10 sufficiently complex to appear in random order to the player. This is a one or two player
11 game. This invention is primarily a game rather than a serious athletic training device
12 and it is described in very narrow terms without any general application to other types of
13 athletic training or contests. This invention requires constant input from the player - the
14 game will lock in any device state where a lamp is lit unless the player strikes the lit part
15 of the display to allow it to transition to the next state. The designers recognized that a
16 detector failure would render the game inoperable and provided a failsafe mechanism to
17 transition should that occur - but such a transition is not a normal operating mode of the
18 invention. In comparison, the invention of the present patent application, as it might be
19 implemented for martial arts practice, would have lit one or more lamps for short periods
20 of varying duration during which a lit lamp would have been a target for the athlete. The
21 device would then have transitioned to another device state whether or not the athlete

1 succeeded in striking the target(s). An alternative embodiment, which could be used
2 with existing training dummies, would dispense with the lamps entirely and instead
3 announce the targets through a speaker.

4 Elstein et al. U.S. Pat. No. 4,702,475 disclose a sports technique and reaction
5 training system in which a particular movement pattern is to be executed by the
6 participant in a given amount of time in response to a start signal that determines which
7 of several such patterns is to be executed. This invention requires that the participant
8 return to a base position to trigger another training cycle - so that the time required to
9 complete the movement pattern may be measured. Moreover, the purpose of the
10 invention is to train the participant to carry out a choreographed set of motions in
11 minimal time. The present invention is very different. Some of the differences are: the
12 position of the athlete with respect to the device is not fixed (there are no intrinsic start
13 and stop positions); the device runs independently of the athlete's actions (other than
14 setting it and turning it on, the athlete would not normally affect the state of the device);
15 more than one device could be simultaneously employed in training or during a game by
16 an athlete or athletes; and the utility of the invention is to provide state transitions in
17 training to better simulate actual play, or in play, to provide more variety to the game, but
18 not to improve the performance of a predetermined choreographed set of motions.

19 Other instances of the class of athletic measurement devices examined in detail in
20 the preceding paragraph are disclosed in Alston et al. 4,502,489, Mackovjak U.S. Pat. No.
21 5,897,457, Guillen U.S. Pat. N. 6,066,105, and Feiner et al. U.S. Pat. No. 6,278,378 B1.

1 These devices all differ from the present invention in requiring two trigger events: one to
2 initiate a measurement and a second one to indicate its termination. The devices then
3 report the performance in some manner. The present invention utilizes no triggers, does
4 not measure performance in any way, and is used in an altogether different manner than
5 any of these devices.

6 Eger U.S. Pat. No. 5,812,239 discloses a visual training device comprising a
7 plurality of LEDs under microprocessor control arranged around a central hole that in
8 some embodiments holds additional optics. The user looks through the hole and focuses
9 at infinity while simultaneously viewing the LEDs in the peripheral vision as they are lit.
10 To do so the user's eyes must necessarily be centered on the hole and offset back from the
11 device at such a distance that the LEDs will appear in the correct visual region.
12 Effectively this fixes the location of the user's head with respect to the device. This may
13 be an exemplary device for training the eyes of athletes. However, a person standing in a
14 fixed position and rolling her eyes is not engaged in an athletic endeavor, even if such
15 training is of some utility later when she does participate in an athletic activity. These
16 embodiments neither elicit nor allow significant bodily motion and consequently have no
17 utility in athletic training. That this is an eye training device, rather than an athletic
18 training device, is further emphasized by those implementations employing colored filters
19 specifically to exercise different sets of retinal cells, which have different chromatic
20 sensitivities.

1 Eger also discloses more active embodiments that are designed to measure
2 reaction time and accuracy in response to the visual stimulus. As such, these have
3 triggers and other features as described above for other similar measurement devices, and
4 so differ in fundamental ways from the present invention.

5 Eger does not disclose in any embodiment or method the concept of changing the
6 state of the athletic environment. Reactions, if any, are always targeted back to the device
7 itself, and specifically to the signaling lamp, such action serving to confirm that the
8 light's stimulus was perceived, and in some cases to measure the speed and accuracy of
9 that response. This differs fundamentally from the present device which informs the
10 athlete of a change in the training or game environment with the athlete's subsequent
11 response being in that context, and being generally external to, and unrelated to, the
12 presence of the device itself. For instance, in a baseball pitching exercise the present
13 device might be located between the pitcher's mound and home plate and would indicate
14 that the ball should be thrown to a particular base or to home plate, all of which are
15 traditional targets in this athletic context. However, the present device would not itself
16 become the target of the directed action. Similarly, replacing an inert cone with a cone
17 shaped embodiment of the present device in a soccer dribbling drill would add variation
18 to an otherwise static practice but it would not change the nature of the cone in that drill
19 by converting it into a target.

1 BRIEF SUMMARY OF THE INVENTION

2 This device is to be employed in the training of athletes and the playing of athletic
3 games. During these activities athletes observe and respond to signals that vary with time
4 and are generated and displayed by the device. In this manner the device adds a new
5 element to athletic training and enables new types of sports to be played.

6 SUMMARY OF THE INVENTION

7 The present device provides for one or more logical states to be continuously
8 varied, either periodically or randomly, and for this state information to be transmitted to
9 one or more athletes for the purpose of varying the training or game environment. The
10 athlete would perceive this information either visually or aurally as appropriate for each
11 sport. For a specific example consider again the soccer drill described above. This
12 device would either adorn or replace the typical cone marker and would maintain via
13 electronic means two binary variables which would transition On and Off in a periodic or
14 random pattern. This information would be conveyed to the athlete visually - for
15 instance, by providing two rings of light around the cone, one blue, one red, which are lit
16 according to the value of the matching state variable. Together these two variables would
17 encode four device states with the local (to this cone) meanings "Pass on Left", "Pass on
18 Right", "Pass on Left or Right", and "Do not Pass". The time fraction the device spends
19 in each state would be adjustable, as would be the mean frequency of the transitions
20 between these device states and the minimum hold time spent in each device state before
21 a transition would be permitted. An athlete approaching the cone would observe the state

1 of the device and respond as appropriate. Even this simple four state training device
2 could easily be employed in numerous other drills in this and other sports. For instance,
3 the same four state device placed at the top of the basketball key could indicate "left side
4 layup", "right side layup", "shoot from the top of the key", or "shoot immediately." In
5 baseball it might tell a pitcher to throw a curve, slider, fastball, or to throw out the runner
6 at first base. The invention may also be used to globally alter the rules of the athletic
7 contest or practice. Examples: "when the red light is lit players may not shoot on goal" or
8 "player number 5 may shoot".

9 BRIEF DESCRIPTION OF THE DRAWINGS

10 The manifestation of the present invention will necessarily vary depending upon
11 the particular sport. This is particularly true when considering aquatic versus terrestrial
12 playing environments. To illustrate this invention a preferred embodiment is presented
13 for use in the context of a terrestrial game like soccer.

14 Figure 1 Side view of the exterior of the preferred embodiment.

15 Figure 2 Block diagram of the mechanism of the preferred embodiment.

16 Reference Numerals Used in the Drawings:

- 17 10. Ring of Red Light Emitting Diodes
18 20. Ring of Blue Light Emitting Diodes
19 30. Plastic Cone
20 40. Removable Battery
21 50. Electronic Controller

- 1 60. Power Switch
- 2 70. Frequency Dial
- 3 80. Hold Time Dial
- 4 90. DIP Switch DP1
- 5 100. DIP Switch DP2

6 DETAILED DESCRIPTION OF THE DRAWINGS.

7 Figure 1 is a drawing of the exterior of the preferred embodiment of the invention.
8 There are two rings of colored light emitting diodes (LED's) on the device, a red one
9 located near the cone's tip **10** and a blue one **20** located near the middle of the cone. The
10 remainder of the exterior of the device is composed of a strong and durable plastic case
11 **30** in a contrasting color such as yellow or light orange.

12 Figure 2 shows a block diagram of the mechanism. A removable battery **40**
13 provides power. It is connected to a small electronic controller **50**. This is a typical
14 embedded microprocessor based controller that reads its program from internal read only
15 memory. When power is applied via an ON/OFF switch **60**, and at one second intervals
16 thereafter, the controller reads the desired device settings from two dials **70, 80**, and from
17 a pair of 8 position DIP switches DP1, DP2 **90, 100**, and uses its internal program and this
18 setting information to drive the red **10** and blue **20** sets of display LEDs. The Frequency
19 Dial **70** controls the mean frequency at which the device may change state, which can be
20 varied between 600 transitions per minute and 0.1 transitions per minute. The Hold
21 Time Dial **80** sets the minimum hold time a device state must be maintained before a

1 state transition is allowed and is variable between 200 milliseconds and 5 minutes. The
2 switches on DP1 **90** and DP2 **100** control the device in the following manner:
3 DP1,0 determines if the transitions are periodic (fixed rate) or randomly varying around a
4 mean frequency.

5 DP1,1 determines the device state order as sequential {0,1,2,3,0...} or random.

6 DP1,2-4 determine the occupancy for device state 0

7 DP1,5-7 determine the occupancy for device state 1

8 DP2,0-1 unused

9 DP2,2-4 determine the occupancy for device state 2

10 DP2,5-7 determine the occupancy for device state 3

11 The occupancy values set on DP1 **90** and DP2 **100** are integers in the range 0
12 through 7. The total occupancy for the system is the sum of the four device state
13 occupancies. For instance, if these values were 0,5,3,2 (for states 0 through 3,
14 respectively) the device would never enter state 0, would spend 50% of its time in state 1,
15 30% in state 2, and 20% in state 3. To vary only between states 1 and 2, and spend equal
16 time (on average) in each the setting would be 0,N,N,0 where N is between 1 and 7.

17 When used in the soccer dribbling drill application a typical setting might be: random
18 transitions with a mean frequency of 15 transitions per minute, a minimum hold time of
19 .5 seconds, random transition order, and occupancies set to 2,7,7,2. It is assumed that
20 situations will arise where the invention will also be used as a static marker in fixed state.
21 To lock the device into state 2 the occupancy values would be set at 0,0,7,0.

1 Table 1 shows the states of the signal lights and their interpretation by the athlete.
2 The first column indicates the state of the red LEDs, the second column the state of the
3 blue LEDs, the third column the device state, and the fourth column indicates the
4 interpretation of the device state to be made by the athlete within the context of a soccer
5 dribbling drill.

6 TABLE 1

Red Lights	Blue Lights	Device State	Meaning to player
off	off	0	Do not pass
on	off	1	Pass on right side
off	on	2	Pass on left side
on	on	3	Pass on either side

7
8 One example of the invention has been described here in detail to comply with the
9 Patent Statutes and to prove that this device could be constructed by one skilled in the
10 arts. It is emphasized that numerous other implementations of the invention are possible,
11 none of which depart from the scope of the invention itself. These include, but are not
12 limited to: utilizing similar or different implementation technologies; utilizing similar or
13 different implementation details, especially presentation of the state to the athlete via
14 alternative means such as symbolic or alphanumeric displays, or synthesized sounds or
15 speech; customizing for one or more different sports; utilizing more or fewer device
16 states; utilizing physically larger or smaller devices; utilizing multiple independent
17 devices simultaneously on the athletic field; utilizing devices which are carried by the
18 athletes or attached to athletic equipment; utilizing remote control of multiple devices

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1 which all display the same state; utilizing remote control of multiple devices which
2 display different states; utilizing multiple remote devices which are activated sequentially
3 in a predefined or randomly selected in order to simulate, for instance, the motions of
4 another player; and providing in addition to the display of device state information the
5 selective or broadcast relaying of communications from coaches, referees, or other
6 players.

7

8

1 CLAIMS

- 2 2. A device for introducing state changes in athletic activities which comprises:
- 3 ~~a time varying device state; said state being comprised of~~ at least one binary variable,
- 4 said variable(s) encoding the device states;
- 5 a time varying value, the current device state, encoded by the binary variable(s);
- 6 a display; said display presenting the current device state in a form that the athlete
- 7 may interpret as a change in the athletic environment;
- 8 a means for setting the device; said means determining the timing and order in which
- 9 the device transitions between device states, and the average time spent in each
- 10 device state;
- 11 a controller; said controller reading the device settings, ~~maintaining the device~~
- 12 ~~state~~ transitioning between device states in accordance with those settings, and
- 13 communicating the ~~resulting time varying~~ current device state to the display;
- 14 an interruptible power source;
- 15 a durable case; said durable case being appropriate for an athletic activity.
- 16 3. A device according to claim 2, wherein the controller utilizes a microprocessor.
- 17 4. A device according to claim 2, wherein the display comprises sets of differently
- 18 colored LEDs.
- 19 11. A method for the training of athletes and the playing of athletic games comprising the
- 20 steps of:

- 1 (a) setting the ~~manner in which~~ mean frequency of transitions between device states,
2 the minimum hold time and the average time spent in each device state, and the
3 order of the device state is to be varied in time;~~transitions;~~
- 4 (b) the device varying its current device state in accordance with those settings;
- 5 (c) the device displaying ~~said~~ its current device state to the athletes in a form
6 interpretable by them as a change of the environmental state within the context
7 ~~of the current athletic activity;~~
- 8 ~~(d) the athletes reacting to the provided environmental state information as~~
9 ~~appropriate for the current athletic activity.~~
- 10 22. A device according to claim 2, wherein a dial controls the mean frequency of
11 transitions between device states.
- 12 23. A device according to claim 2, wherein a dial sets the minimum hold time spent in
13 each device state before a transition is permitted.
- 14 24. A device according to claim 2, wherein a switch sets the ~~device state order to be~~ order
15 of transitions between device states as sequential or random.
- 16 25. A device according to claim 2, wherein ~~the~~ an occupancy value is set for each device
17 state, said occupancy values ~~determined~~ determining the average time spent in each
18 device state.
- 19 26. A device according to claim 2, wherein the interruptible power source is a removable
20 battery.
- 21 27. A device according to claim 2, wherein a switch may interrupt the power.

- 1 **28.** A device according to claim 2, wherein ~~each set~~the display comprises sets of LEDs ~~is~~
2 arranged in ~~a ring~~ings around a conical case.
- 3 **29.** A device according to claim 2, wherein ~~each set of LEDs has a different color~~the
4 display comprises sets of differently colored LEDs arranged with each set in a colored
5 ring around a conical case.
- 6 **30.** A method according to claim 11, wherein the order of the device state transitions is
7 random and the timing of the device state transitions is random.
- 8 **31.** A method according to claim 11, wherein the order of the device state transitions is
9 sequential and the timing of the device state transitions is random.
- 10 **32.** A method according to claim 11, wherein the order of the device state transitions is
11 random and the timing of the device state transitions is periodic.
- 12 **33.** A method according to claim 11, wherein the order of the device state transitions is
13 sequential and the timing of the device state transitions is periodic.
- 14 **34.** A method according to claim 11, wherein the athletic activity is a soccer dribbling
15 ~~drill and the four states of the device~~drill, the device utilizes four device states, and
16 these device states correspond to the environmental states: “do not pass”, “pass on
17 the right”, “pass on the left”, and “pass on either side”.
- 18 **35.** A method according to claim 11, wherein the athletic activity is a basketball ~~drill and~~
19 ~~the four states of the device~~drill, the device utilizes four device states, and these
20 device states correspond to the environmental states: “left side layup”, “right side
21 layup”, “shoot from the top of the key”, and “shoot immediately”.

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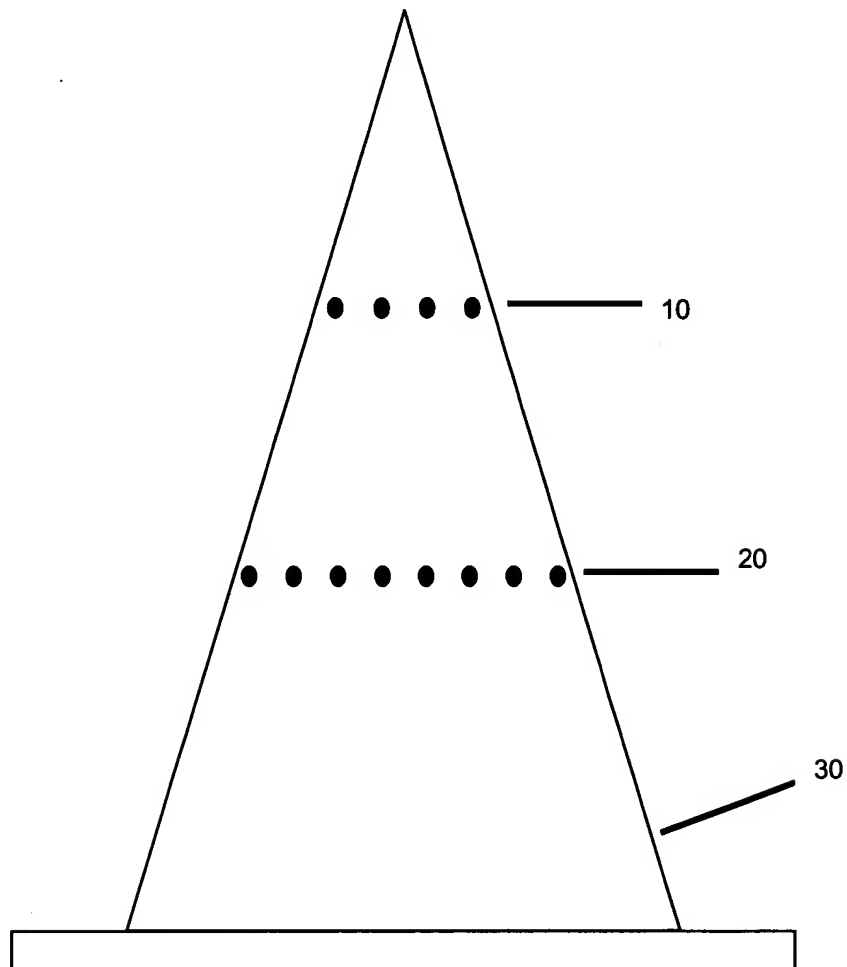
- 1 36. A method according to claim 11, wherein the athletic activity is a baseball pitching
- 2 ~~drill and the four states of the device~~drill, the device utilizes four device states, and
- 3 these device states correspond to the environmental states: “throw a curve”, “throw a
- 4 slider”, “throw a fastball”, “throw out the runner at first base”.

1 ABSTRACT OF THE DISCLOSURE

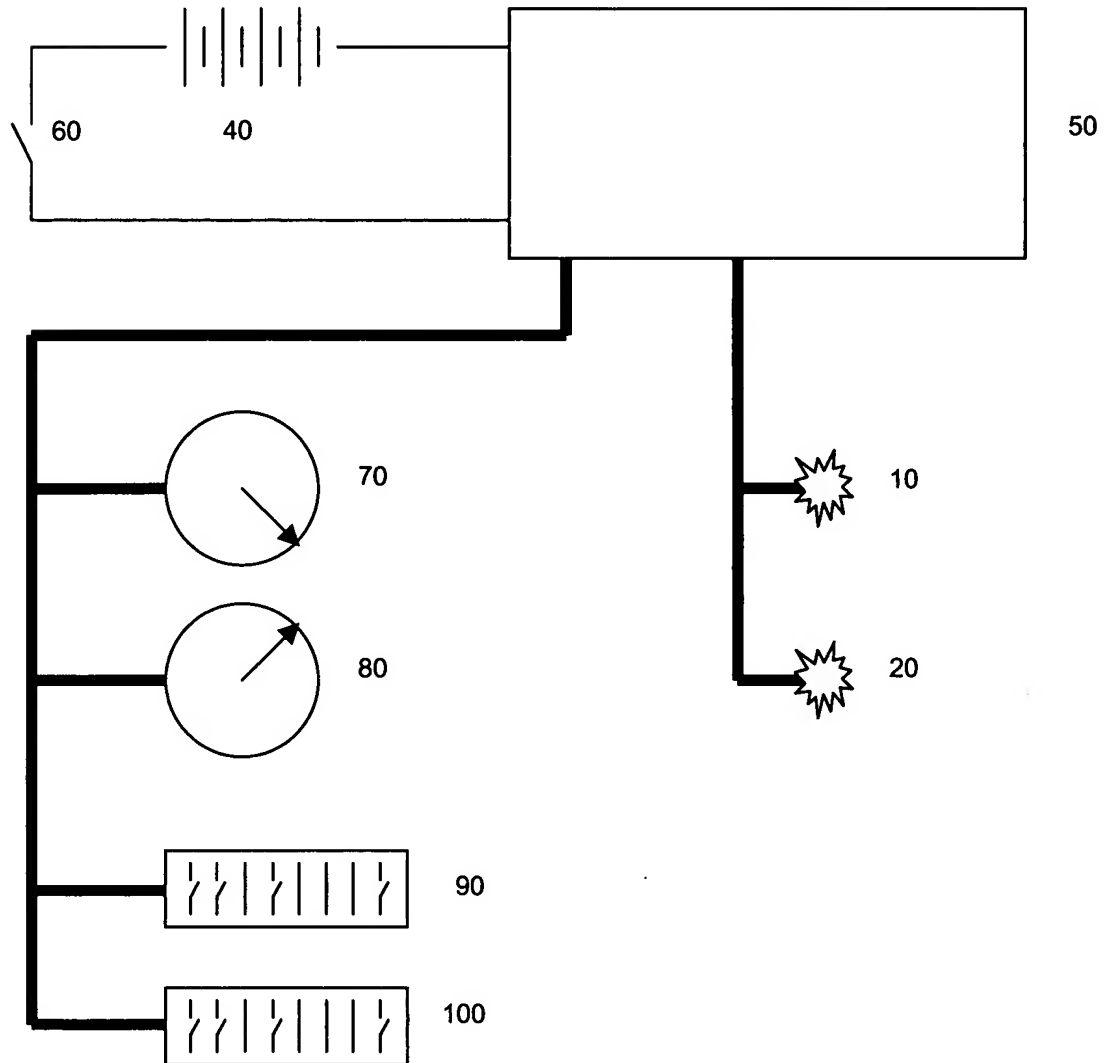
2 A device is described for introducing variation in athletic training and competitive
3 events. This device maintains an internal state that occupies one of several allowed
4 values. Depending upon the selected configuration, the device changes internal state at
5 regular or irregular intervals, progresses through its allowed values sequentially or in
6 random order, and spends a different designated fraction of time in each state. This
7 variable and typically unpredictable state is presented to the field of play where one or
8 more athletes receive the information and react to it as a change in their athletic training
9 or game environment.

1 FIGURE 1. The exterior of the invention – side view

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1 FIGURE 2. Block diagram of the mechanism
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Appl. No. : 10/025,310 Patent Documents cited
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U.S. PATENT DOCUMENTS CITED in the REVISED APPLICATION:

U.S. Patent No. 3,629,600: EMERGENCY TRAFFIC LIGHT CONTROLLER

U.S. Patent No. 3,789,402: ELECTRONIC SIGNAL DEVICE AND METHOD

U.S. Patent No. 3,933,354: REFLEX TESTING AMUSEMENT DEVICE

U.S. Patent No. 4,502,489: APPARATUS FOR MEASURING AUDITORY
REACTION TIME.

U.S. Patent No. 4,702,475: SPORTS TECHNIQUE AND REACTION TRAINING
SYSTEM

U.S. Patent No. 4,949,320: ACOUSTIC SIGNAL APPARATUS.

U.S. Patent No. 5,325,340: PACING DEVICE

U.S. Patent No. 5,812,239: METHOD AND ARRANGEMENT FOR THE
ENHANCEMENT OF VISION AND/OR HAND-EYE COORDINATION

U.S. Patent No. 5,897,457: ATHLETIC PERFORMANCE MONITORING SYSTEM.

U.S. Patent No. 5,921,890: PROGRAMMABLE AUDIBLE PACING DEVICE.

U.S. Patent No. 6,066,105: REFLEX TESTER AND METHOD FOR MEASUREMENT

U.S. Patent No. 6,278,378 B1: PERFORMANCE AND ENTERTAINMENT DEVICE
AND METHOD OF USING THE SAME